v. 5, n. 21, 2025

International Journal of Health Science

BENEFITS OBTAINED BY APPLYING THE DMI TECHNIQUE IN PATIENTS WITH CEREBELLITIS SINGLE CASE

Acceptance date: 15/05/2025

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Abstract: The present investigation is made of a single case of post-infectious Cerebellitis caused by an ear infection, focusing on motor disorders such as ataxic gait, alteration in balance and coordination of a pediatric patient, to treat these alterations a treatment proposal was raised to reduce the sequelae of the disease, by means of this technique DMI (Dynamic Movement Intervention), since it is a novel technique and that is not applied to this pathology, which presents great results when applied in patients with alterations in gross motor skills which fall within the parameters of application to be able to apply it in the selected patient. The results of this technique are the exercises that make up the (DMI) that were addressed in the following intervention were favorable in the motor area, however it was possible to obtain unexpected benefits from the application of this technique as it addresses different areas together, achieving a positive impact and benefit in the research and leaving a new criterion for the application of this, reinforcing research on movement and learning in developmental windows in which this technique exploits its maximum splendor to obtain straightening reactions creating awareness and memory to these new stimuli.
Keywords: Dmi, Exercise, Cerebellitis, Techniques, Ataxia, Viruses And Clinical Manifestations

INTRODUCTION

The following research is based on the analysis of the affectations caused by post-infectious Cerebellitis in a pediatric patient, as well as the implementation of an intervention protocol with the Dynamic Movement Intervention (DMI) technique, with the purpose of analyzing the benefits obtained by applying DMI exercises in a patient with motor sequelae caused by Cerebellitis, for which a series of exercises were selected to suit the needs of the patient.

Throughout this research, topics such as the anatomy of the cerebellum and its physiology will be addressed, while the vestibular system will be included, since it is of great relevance in this pathology due to the affectations that will produce alterations in both balance and coordination.

Likewise, the theoretical bases of the DMI technique will be addressed, as well as the pathology on which the research is based, in order to identify the sequelae that this pathology brings with it and to make a work plan that allows us to reduce the sequelae, i.e. that these alterations at the motor level are less marked in the patient.

PROBLEM STATEMENT

At present it is known that more than half of the population presenting Cerebellitis has a common etiology "Acute post infectious Cerebellitis", despite the high incidence of this in the physiotherapeutic field, it has not yet found the right information to address in a clear and timely manner the consequences that this pathology brings with it.

Therefore, our study subject will be a 3-year-old pediatric patient who presents gait alterations as a sequel caused by Cerebellitis, highlighting alterations in balance, coordination and ataxic gait, which is why we consider of great interest to find out more about the DMI (Dynamic Movement Intervention) method and what benefits are obtained in this patient by implementing a treatment with the technique, focusing on the three motor alterations already mentioned, because the patient's life has been drastically affected since it is currently difficult for her to perform activities that she used to perform without any difficulty, such as running, walking, kicking a ball, among others. On the other hand, it is important to know that movement is fundamental for the growth and development of both motor and cognitive skills and the fact

that gross motor skills are altered at such a young age affects not only the patient's quality of life but also generates a delay in the development of motor skills, Therefore, this research is focused on finding out what are the benefits offered by DMI in the treatment of a patient with sequelae caused by Cerebellitis, seeking to counteract the alterations in balance, coordination and that the ataxia gait is not so noticeable, This by means of the intervention with exercises of the DMI technique which was designed or created to treat pediatric patients where the straightening reaction is stimulated through continuous movements in small periods of , in order to generate autonomous responses in posture control, therefore we consider that the DMI technique (Dynamic Movement Intervention) can be of great benefit when intervening patients, however there has not yet been an investigation to indicate whether or not this technique has benefits in patients with sequelae caused by this pathology.

JUSTIFICATION

DMI (Dynamic Movement Intervention) is a physiotherapeutic technique designed for the intervention of pediatric patients through various exercises that generate benefits in gross motor skills, postural control, increases range of motion, enhances the achievement of developmental milestones and improves balance and coordination (Jake Kreindler, 2024).

Due to the multiple benefits offered by this technique, a physiotherapeutic treatment plan will be designed with DMI (Dynamic Movement Intervention) exercises in a three year old female patient, who was diagnosed with post-infectious Cerebellitis at the age of 1 year and 9 months who after suffering this pathology lost the motor skills she had already developed, including running and walking without help, by implementing this work plan we will seek to analyze what are the scopes that this technique will provide in the recovery of the infant, It is expected to achieve favorable benefits during the intervention of the patient with exercises of the DMI technique (Dynamic Movement Intervention), it is worth mentioning that these exercises will be previously selected according to the motor needs presented by our subject of study, at the time of implementing the work plan with this technique is expected that the motor disturbances in balance, coordination and ataxic gait are less noticeable this in order help improve the quality of life of the patient making it less dependent on the comprehensive care of her guardian. Above all, we hope that the DMI technique will give positive results that will allow the patient to be more functional and that she will be able to interact or manage in a better way in her environment.

THEORETICAL FRAMEWORK

Two young people focused on physical therapy since its inception in the pediatric area, managed to identify the main problems that existed in intervention of infants where most of their diagnosis usually bring with them alterations at the level of gross motor skills, they were able to identify the needs of the treatments already established which were routine, which motivated them to seek a new approach to help in the recovery of patients. While searching the basis to create an innovative technique, they discovered "The Darwinian Theory" by neuroscientist Gerald M. Edelman, with multiple approaches that all health personnel should know. Thus began a search of which we need to know certain bases to understand what are these ideas and knowledge that in the end are unified into one resulting in the DMI technique. , we will focus on neural Darwinism where it is mentioned that natural selection could be considered similar, but with different mechanisms towards the nervous system, although it tends to vary according

International Journal of Health Science ISSN 2764-0159 DOI https://doi.org/10.22533/at.ed.1595212512052

to the individual, Gerald M. unifies them in perception, action and learning. He also considers memory as a dynamic process of recategorization instead of a replicative deposit of different attributes, all these theories emphasize the knowledge of the wide scope of brain functions destined by the estimation of constantly renewed actions (Edelman, 1987). This is how physiotherapists began to formulate a new vision. So what happens to these children? They need an enriching environment to create an experienced brain, so at the time of generating new neuronal connections there is what is a neuronal pruning where certain connections that the individual is normally constantly reactivating will strengthened, for this it is necessary that before an immature brain there are certain stimuli mainly of movement and sensory in their first years of life resulting in a strengthening effect on the synapses during its development where we can find windows that will enhance to its maximum splendor what is the motor development, These windows are usually open until the age of 5 years, that is why it is important to lay the foundations of motor control, everything is based on learning through play and movement is a dynamic experience that encourages infants (Carl Gabbard, 2009).

On the other hand, we cannot ignore the importance of neuroplasticity as the brain's ability to change and heal itself, we have to keep in mind that a child's brain grows and recovers differently than an adult's brain. Although neuroplasticity can exist in both transforming their lives, Dr. Pape introduces us a little bit to what this means. Thousands of children suffer from Cerebral Palsy and yet their recovery story usually very encouraging, although this involves a long process, Dr. Karen Pape has investigated all these exceptional cases where children can get to run and play soccer, but at the time of implementing their walk this is usually considered abnormal, It is here where she manages to identify that a damaged and immature brain learns in a certain way since it will adapt to the difficulties and limitations that it has, however, when the brain is already mature and recovered its learning is much better, they usually focus on learning activities at the time, not in those that can be learned later.

In the year 2021 these two young people decided to implement a new technique based on the constant need for a new approach to the treatment of infants with multiple motor disorders, in which they sought to improve gross motor skills, stimulate postural control, increase the range of motion and even thought about how to help patients so that they could meet the milestones of development according to their age range, they also wanted their technique will help in the recovery of balance and postural control all this through dynamic movements that demand postures in infants. It is here where these young people working in the same field decided to base their technique on topics such as; neuronal Darwinism, the boy who could run, But not walk or Brain plasticity in pediatric. Jake Kreindler graduated from Touro College's master's degree in physical therapy in 1997 and since that time his education and knowledge of the subject has expanded. During the summer months he began practicing DMI (Dynamic Movement Intervention) on children in New York, then began traveling the United States and the world performing intensive therapy and training new therapists to implement DMI on their patients as well. Jo - Anne Weltman, co-founder of DMI, graduated from Wits University in Johannesburg, South Africa in 1991 with a degree in Physiotherapy.

Throughout his career he has taken several courses in order to innovate in the implementation of new treatments always looking for favorable benefits when implementing them in patients. When creating this techni-

que, they both had a clear goal in mind: "to innovate" with a technique based on dynamic movement, which would revolutionize physical therapy as we know it.

Physical therapists who have had the opportunity to implement this technique have been fascinated by the results that their patients presented, however, this technique is not indicated for all patients especially with degenerative diseases, dislocations or bone fragility. This is how they created a technique that would revolutionize the application of Dynamic Movement Intervention Therapy treatments; this technique not only benefits the patient, but also benefits the needs of family members with children who present motor alterations since it does not require mechanical materials, which makes the therapy more accessible in terms of cost.

Dynamic movements find something that captures the attention of patients, proving beneficial since obtaining repetitive stimuli that allow to obtain controlled movements, generate neuroplasticity and in turn cooperative working memories makes the patient's recovery favorable (Jake Kreindler, 2024).

Seeing the good results obtained by implementing these techniques then began a need for which extended its field of work by creating two new clinics which are based on teaching, plus a support network which was dedicated to distribute through courses this technique as revolutionary as it is DMI, mostly associated with this institution have been dedicated to the spread of knowledge and implementation of the technique both in patients and in teaching, have been dedicated to volunteering in countries with conflicts or that have a greater vulnerable sector.

HOW CAN DMI BE DEFINED?

We can define DMI (Dynamic Movement Intervention) as a physiotherapeutic technique which seeks through dynamic movements to obtain reflex acts that stimulate postural control, DMI is a form of intervention that seeks timely improvement through neuroplasticity in the first years of life of the infant where there is usually a greater neuronal pruning which facilitates not only motor skills but also stimulates language and feelings in this period of time, focuses more on the skills that the patient will get long after their recovery time skills they will get, the movement is the main source of learning in infants who will constantly be stimulated.

Figure 1 Application of DMI exercises for trunk control.

Exercises used in a 3-year-old pediatric patient with post-infectious Cerebellitis.

Exercise	Description	Example
Exercise 1	Hold sitting on a board in the air, while wobbling the board slightly from side to side.	
Exercise 2	Standing upright on a board holding your knees the board slides laterally and from front to back.	
Exercise 3	Feet on two planks, hold at knee level while pulling up one plank and lowering each leg.	
Exercise 4	Hold your knees completely straight while in the area.	

Table 1. Exercises carried out during the research

CEREBELITIS

Acute cerebellitis is an uncommon condition, this pathology can present several clinical manifestations such as vomiting, headache and decreased level of consciousness, as well as cerebellar syndrome where clinical signs such as ataxia, dysmetria, dysarthria and vertiginous sensation can be identified. It is worth mentioning that each patient may or may not present these signs and symptoms since they will vary depending on the etiology, i.e. the source causing the pathology.

It has been demonstrated that the most common cause is primary infections of the cerebellum, as a post-infectious entity or as a consequence of a post-vaccinal alteration. Depending on the cause that triggers the pathology, the clinical manifestations presented by each patient will vary; some may present benign signs and symptoms while others may present more severe complications that may endanger the patient's life.

The pathophysiological process of this disease is still not known for sure, however some literature refers that there will be an edematous process, of autoimmune mechanism, with lymphocytic and eosinophilic infiltration without evidence of demyelination, which would establish a fundamental difference between acute Cerebellitis and acute Encephalomyelitis (J.P Garcia, Acute Cerebellitis in Pediatrics: Our Experimental, 2019).

Although it is true that it has not been possible to understand the pathophysiology of this disease, it has been possible to identify some of the causes that can trigger this pathological process such as measles virus, rubella virus, mumps virus, herpes simplex virus-1, rotavirus, salmonella, Mycoplasma pneumoniae, among others. Antimicrobial treatment should be considered first hand as this disease is related to different pathogens (J.P Garcia, Acute Cerebellitis in Pediatrics: our experimental, 2019).

CLINICAL MANIFESTATIONS OF CEREBELLITIS

Clinical manifestations	Common	Uncommon	Rare
Vomiting	YES		
Ataxia	YES		
Decreased level of consciousness			YES
Headache	YES		
Fever		YES	
Vertigo			YES
Drowsiness		YES	YES

Some of the signs that have been detected in patients with Cerebellitis are listed below.

Etiologies
Mumps virus
Varicella-zoster virus
Epstein-Barr Virus
Herpes simplex virus-1
Rotavirus
Mycoplasma pneumoniae
Influenza virus
Salmonella

24% of cases of Cerebellitis have been associated with infectious processes (J.P Garcia, Acute Cerebellitis in Pediatrics: our experimental, 2019).

ACUTE POST-INFECTIOUS CEREBELLAR ATAXIA

Gait is a complex system that allows us to move in different directions. When there is some kind of neurological damage such as lesions in the pyramidal pathway, spinal cord lesions, Becker muscular dystrophy, alteration in the cerebellum or in the pathways of this anatomical structure, different types of pathological gait will occur, alteration in the cerebellum or in the pathways of this anatomical structure will produce different types of pathological gait and this will depend on which neurological area is affected, in this case we will focus on ataxic gait "motor incoordination" since this type of gait will originate when there is some type of neurological affectation at the cerebellum level. Ataxic gait is characterized by the alteration in coordination when trying to perform some kind of voluntary movement (J.P Garcia, Acute Cerebellitis in Pediatrics: our experimental, 2019).

When the cerebellum is affected in its afferent and efferent pathways, ataxic gait is present, where the affected patient will not walk in a straight line, but will move from one side to the other, causing stumbling and opening the arms in an attempt to try to find some stability. In some cases, patients may present vertigo, loss of strength in the proximal muscles of the lower limbs.

CONCLUSION

During the process of this research we were able to confirm that the application of a physiotherapeutic treatment plan with exercises of the Dynamic Movement Intervention technique has shown to have positive effects in patients who present alterations at the level of gross motor skills, so it is recommended to use the DMI technique in this group of patients since the intervention with this technique has noticeable benefits from the first weeks. Likewise, we have identified that a treatment with DMI also has benefits at a cognitive-behavioral level, so it is considered a good treatment option.

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