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Neuroplasticity in the rehabilitation of patients affected by stroke spastic:Restriction and movement induction therapy (TRIM)

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Neuroplasticity in the rehabilitation of patients affected by spastic stroke:

Restriction and movement induction therapy (TRIM)

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Summary

Cerebral Vascular Accident (CVA) is an acute onset pathology due to neurological deficit. ANeuroplasticity is the ability of neurons to change their functions, structure and chemical profile.ANDAmong the techniques that employ neuroplasticity for rehabilitation is (TRIM)**Goal:**analyze the benefits of neuroplasticity in the rehabilitation process of patients affected by spastic stroke**Methodology**: This is a literature review. Articles (published between 2008 and 2018) were used in the virtual libraries Google Scholar, Lilacs and Scielo**Results:**They were10 articles were selected, published between 2008 and 2020and all demonstrated the effectiveness of applying neoplasticity in the patient rehabilitation process**Conclusion:**Neuroplasticity is essential for the rehabilitation of patients affected by stroke, one of the methods used to stimulate it is TRIM, which has demonstrated effectiveness in results regarding motor gains in carrying out activities, reorganization of the motor cortex and overcoming learned non-use . **Key words:**Neuroplasticity. Rehabilitation. Stroke.

1. Introduction

The brain is an extremely complex organ that, in addition to being a place for cognition and human intellectual activities, also controls and regulates bodily functions. It is made up of countless connections between neurons. Obstruction of one of the important cerebral arteries (middle, posterior and anterior, in descending order of frequencies) is what commonly triggers stroke, or of its smaller perforating branches that go to the deeper parts of the brain (EKMAN , 2008).

Generally, the most common symptoms in the onset of a stroke are: change in sensitivity on one or both sides of the body, change in strength, difficulty speaking, difficulty or confusion in understanding and communicating, difficulty with balance and walking, difficulty seeing with one or both eyes, sudden and atypical headache (DINIZ, 2003).

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Stroke is an acute onset pathology due to neurological deficit resulting from cerebral blood circulation disturbance that persists for at least twenty-four hours. Lesions of the central nervous system (CNS) resulting from a stroke have the main consequence of spasticity, being one of the main causes of functional loss and that is why therapeutic interventions must be prioritized (EKMAN, 2008).

In this way, treatment objectives are directed towards learning new skills or techniques for carrying out activities. This learning fundamentally depends on the ability of key elements to regulate CNS neuroplasticity (MARQUES, 2016).

Among the techniques that employ neuroplasticity as support for rehabilitation is Movement Restriction and Induction Therapy (TRIM), which in 1981 had its first reports published by Ostendorf and Wolf, and subsequent to this clinical trial studies were also carried out, where it was verified through transcranial magnetic stimuli that there is almost twice as much excitation in the affected hemisphere with the use of TRIM techniques (BROL, 2009).

Changes in brain structures and in the gray regions of the sensory and motor areas of the brain are also considered, as well as changes in the hippocampus, which are directly linked to the learning and memory process (PEREIRA, 2010).

This study's main objective was to analyze the benefits of neuroplasticity applied in the rehabilitation process of patients suffering from spastic stroke. To do this, it was necessary to review aspects relating to pathology and study the benefits of neuroplasticity introduced as a physiological basis for rehabilitation.

2 Methodology

This study is a literature review that addresses the application of neuroplasticity in the rehabilitation of patients affected by spastic stroke. Data collection was carried out in electronic databases: Google, Bireme, Lilacs and SciELO, as research strategies the following descriptors “Neuroplasticity, Rehabilitation, Stroke” were used as keywords. 10 articles related to the proposed topic were selected, published between 2008 and 2020 in English and Portuguese, of which, after analysis, 4 were excluded due to the fact that they did not fit the inclusion criteria. The inclusion criteria covered articles that addressed neuroplasticity in the rehabilitation of patients with spastic stroke.

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3 Theoretical foundation

The brain is an organ very susceptible to disorders that compromise blood supply, an example is ischemia, which can cause changes in neurological signs or even irreversible neural damage. Stroke can happen when blood flow is interrupted due to insufficient O2 to the brain. The main causes of this type of stroke are, among others, high blood pressure, amyloid angiopathy and also the rupture of a cerebral aneurysm. The main symptoms and signs of a stroke are: headache, dysarthria, changes in consciousness, aphasia, blurred vision, diplopia, vertigo, balance disorders, hemi or monoparesis and also sensory deficits (EKMAN, 2008).

Physiologically, the triggering of spasticity is directly linked to the imbalance that occurs between the inhibitory and facilitating influences of the descending pathways responsible for regulating muscle tone, favoring the deactivation of the flexor muscles and resulting in the release of the joint extensor muscles. Depending on the region of the brain that was injured, a stroke can lead to motor and sensory disabilities and dysfunctions. After a stroke, there is a reduction in muscle tone or hypotonia, which is followed by a progressive increase in muscle tone, known as hypertonia. This may have characteristics of rigidity or spasticity (DINIZ, 2003).

Spasticity is the most common, and is the result of a lesion of the upper motor neuron, specifically, of the corticospinal pathways (pyramidal tracts), called spasticity syndrome.upper motor neuron. It results in the loss of inhibitory control over the lower motor neurons.From a functional point of view, spasticity can be defined as a motor disorder, where its main characteristic is the elevation of the stretch reflex when a passive stretch is imposed depending on the speed and resistance to it. It is, therefore, defined by the degree of excitability of the muscle spindle, which specifically depends on the speed at which movements are performed (MUSSE, 2002).

Physiotherapy is extremely important in neurological disorders, as it has numerous resources that help to “improve” or recover the motor and functional capabilities of patients affected by this type of dysfunction. Evidence points to the effectiveness of physiotherapy after stroke, and that the greater the intensity of treatment, the better the results. The damage that a stroke causes to the brain can lead to loss of function, but through a phenomenon called “neuroplasticity”, there is the possibility of readjustment

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of the brain functionally, thus defining a reorganization of the cortical maps that cooperate for stroke recovery (BROL, 2009).

The recovery of function in the limbs that plasticity promotes is inhibited by a phenomenon called “learned non-use”. Where there is loss of function in a certain area of the brain affected by the stroke, the region of the body that was linked to that area is also affected, causing it to lose its ability to move (OLIVEIRA, 2001).

Brain plasticity is the way in which the organism makes lasting functional changes, enabling accommodation between the individual's possibilities and the challenges of the environment. Experience-dependent plasticity is accompanied by an increase in the number of synapses and post-injury, this experience is the most considerable modulator of neurophysiological and neuroanatomical changes in tissues that were not affected. In physiotherapy, the concept of neuroplasticity is extremely important, as it represents progress in the rehabilitation process, after all, the recovery process depends fundamentally on the reorganization of circuits that were separated in injuries (BROL, 2009).

It is important to highlight that neuroplasticity is a dynamic process, in which the *input* afferent, when correctly directed, provides therapeutic advantages. In turn, Physiotherapy uses strategies based on biomechanics and sensory stimuli, where its main objective is to promote brain reorganization, in addition to continuing to stimulate neuronal plasticity, considering that, after a CNS injury, Central Nervous System, there is a cortical reorganization established by the organism itself, which needs treatment. Thus, it can be defined as any change in the nervous system that is not periodic and lasts longer than a few seconds. Or even the ability of the central nervous system to adapt, especially the ability of neurons, to changes in environmental conditions that occur daily in individuals' lives (LIMA, 2014).

Due to the high plastic capacity of the central nervous system, some intensive physical treatment techniques have emerged, such as Movement Restriction and Induction Therapy (TRIM), also known as Induced Containment Therapy (TCI), which uses neuroplasticity as a way of facilitating rehabilitative practice, which is linked to motor training, and this will be a source of brain development as it has the capacity to induce changes in neural plasticity, triggering patterns of sensory stimulation

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proprioceptive that can modulate neuroplasticity in motor and soma tosensory areas (GAMBA, 2011).

TRIM uses “learned non-use” methods, that is, the unaffected limb is restricted from application with only training to use the compromised limb, meaning forced use of the compromised limb will occur with the aim of causing motor gains. . The principles of this technique consist of restricting the upper extremity that is not affected by the injury for 90% of the day, directly linked to daily training of the extremity that is affected for around 6 hours every day for two weeks, which is equivalent to 10 days useful (PEREIRA, 2010).

Through the new direction of attention established by the application of TRIM, capabilities that already exist are improved and other new capabilities are learned, resulting in functional improvement in the paretic upper limb and neuronal changes in the cerebral cortex that can be evidenced through nuclear magnetic resonance imaging. . The influences and benefits acquired through neuroplasticity related to gains generated by TRIM, occur as a result of its three basic principles and fundamentally in the motor training of the compromised limb. The principles are basically restitution, replacement and compensation (MARQUES, 2016).

The sooner rehabilitation is started, the more quickly and easily the benefits of neuroplasticity will be acquired, one of the hypotheses being the restriction of reactive glucose, which represents a negative event in the process of recovering independence and motor functionality. Regarding the difficulties encountered in relation to the application of this therapy, they refer to the intensity of the treatment, safety and patient adherence. In clinical practice, it is essential to highlight the high cost of treatment as it is essential that the patient remains in the outpatient clinic daily for several hours (GAMBA, 2011).

TRIM has the central objective of influencing the patient to use the paretic limb for several hours a day, on consecutive days. Therefore, it is essential to restrict the unaffected extremity, and for this purpose the use of a sling or glove is recommended, something that can impede movement. It is important to evaluate pre and post application of the method, therefore cortical mapping before and after the application of TRIM in post-stroke patients must be carried out, generally through transcranial magnetic stimulation, and also through functional magnetic resonance imaging (PEREIRA, 2010).

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Conclusion

However, given the high incidence of stroke and the damage caused, the studies consulted make important contributions in terms of improving and improving the rehabilitation of spastic patients. This pathology is a global health problem and the large number of people with sensorimotor impairments has been a reason to search for solutions aimed at recovery.

Neuroplasticity is extremely important for the rehabilitation of patients affected by stroke, and one of the methods used to stimulate it is TRIM, which has demonstrated effectiveness with positive results with regard to motor gains in carrying out daily activities, and quality of life, reflecting positively on the development and independence of the injured patient, obtaining satisfactory results in terms of reorganizing the motor cortex and overcoming learned non-use.

Despite there being great interest in post-stroke rehabilitation, there are still few proven, randomized and controlled clinical studies on this subject. In fact, physiotherapy intervention considerably minimizes spasticity, improving the patient's functionality and activities of daily living, and it is important that it is applied early.

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