ALL ABOUT SPASTICITY

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WHAT IS SPASTICITY?

The muscles of the body maintain what is called "normal muscle tone," a level of muscle tension that allows us to hold ourselves up. When the tension in these muscles increases ***they become rigid*** *and are said to be "spastic." When muscles become spastic, their range of motion decreases and movement of these muscles can be painful.*

Spasticity is one of the **most common** symptoms of multiple sclerosis (MS) and is defined as **muscle stiffness** that is frequently generalized and that causes more or less continuous rigidity. It is normally associated with temporary periods of worsening, in the form of involuntary muscle spasms, all the while muscle function is progressively lost.

It is **one of the primary reasons for disability** in MS since it tends to be associated with pain (continuous or due to spasms), changes in bladder function and in sleep, the inability to walk and perform other movements, including those required for personal hygiene.

Spasms are **involuntary muscular** movements in the limbs and torso. There are three kinds of spasms:

- **Flexors:** make the limbs bend at the joints.
- **Extensors:** make the limbs extend themselves.
- **Adductors:** make the limbs close tightly to the body's midline (arms pulled toward trunk, the legs close together, etc.).

WHAT ARE THE SYMPTOMS?

People suffering from spasticity associated with MS, may present with a variety of symptoms, including:

- Hypertonicity (increased muscle tone), which can, in some cases, lead to muscle stiffness, rigid joints and bladder dysfunction
- Spontaneous muscle activity in the form of uncontrollable muscle spasms that are either isolated in nature or present as a series of rapid muscle contractions (called clonus)
- Exaggerated tendon reflexes

Which is associated with:

- Pain that can range from slight (tense muscles) to severe (painful spasms in the limbs).
- Nocturnal awakening: due to pain and/or bladder dysfunction.
- Deterioration of muscle function that may affect walking, all other types of movements and speech.

These symptoms of spasticity can **result in functional disabilities** including changes in posture caused by an increase in muscle tone (muscle tension or activity state). Muscles must normally sustain an adequate level of muscle tone in order to keep the body upright and allow for movement, while at the same time permitting flexibility and speed during movement.

Spasticity is the result of increased muscle tone, which results in a loss of muscle response.

These effects can notably increase fatigue and make performing daily activities challenging.

Spasticity can also lead to the following:

- **Problems using the legs and arms:** people suffering from spasticity associated with MS tend to see their mobility reduced, which often implies a reduced quality of life and a change in daily activities.
- **Fatigue/lack of energy:** presents in more than 90% of patients with **MS**. **MS-associated** fatigue can have dramatic effects on the professional and social interactions of patients.
- **Bladder dysfunction:** is a very common problem in MS patients. A high percentage of patients have to go to the bathroom frequently as a result.
- **Sleep disorders:** is the factor that most contributes to fatigue in patients with MS.
- **Spasms:** sudden, painful muscle contractions that can disturb sleep and contribute to daytime fatigue.

Spasticity can make walking, sitting down or getting up from a chair, bathing, stretching, getting dressed or other daily activities difficult. In addition, some patients report that uncontrollable spasms often cause uncomfortable situations. Spasticity can lower your self-esteem. As a result, the patient **should talk frankly and freely with those around him or her** (i.e., family members, friend, medical personnel).

Not all patients who suffer from spasticity have pain. When there is pain, it is usually due to muscle rigidity, which causes the tendons to shorten, making it difficult to bend or extend the limbs. The tissues become knotted (contracted) and the result is pain. Some people with spasticity suffer from deep, continuous pain in the joints.

On occasion, a certain degree of spasticity can help to compensate for motor weakness in the legs, allowing patients to walk, stand up or move from one seat to another.

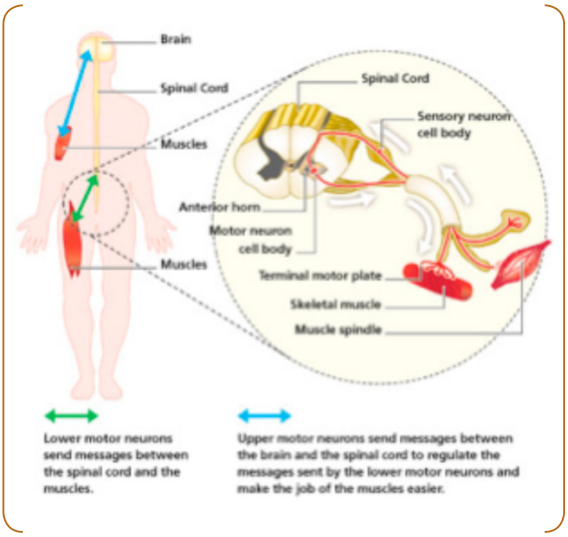
WHY DOES IT OCCUR?

The basic cells of the nervous system are called neurons and are protected with a kind of "sheath" made out of a protein called myelin (in the same way an electrical cable is protected by plastic). Neurons transmit the signals needed for the normal functioning of our motor skills and senses. The central nervous system (which includes

the brain, the cerebellum and the spinal cord) is responsible for processing these functions, which allows, for example, some muscles to contract while other relax when carrying out a particular movement. This takes place because the brain sends messages to the spinal cord and from there to the muscles.

In MS, these messages are not transmitted properly because **the paths between the brain, the spinal cord and the muscles are damaged.** The messages are scrambled and several muscle groups contract at the same time when they should not. **Precise motor control is lost progressively** and simultaneous contraction of the extensor and flexor muscles leads to a lack of coordination, often with painful and debilitating results.

As with all symptoms associated with MS, spasticity is the result of **progressive degradation of myelin** and of the nerve fibers. This results in a **corresponding degradation of the signal that is transmitted** by the neurons responsible for carrying impulses from the brain and the spinal cord to the muscles, thereby causing excessive activation. The **alpha motor neurons** (responsible for initiating muscle contractions) are particularly affected.



HOW FREQUENTLY DOES IT OCCUR?

Spasticity occurs **in the great majority of patients with MS**, in varying degrees.

MS is a **very variable** disease with respect to how it presents and progresses. From the point of view of the symptoms (e.g., spasticity), **"flares" are most frequently observed initially**. An flare is considered to be any new and abrupt neurological change or symptom (lasting more than 24 hours) or a clear worsening of previous symptoms (in the absence of fever or any kind of medication that could worsen the patient's general health status, like sedatives).

Spasticity flares can **vary greatly in their intensity, duration and recovery period among different patients**. Their intensity can range from mild, where they do not affect daily life at all, to severe, where they greatly affect a person's daily activities. The duration of the flares can range between a few days (always more than 24 hours) to several weeks, with the recovery period lasting between a few days to up to 3 months.

Over time, for the majority of patients, MS symptoms stop appearing in flares and simply remain continuously. This is also the case with spasticity, where a continuous degree of rigidity is maintained, with more or fewer spasms.

DIAGNOSIS AND MONITORING

Various tests **can be conducted to diagnose and monitor the progression of the spasticity.** These tests evaluate muscular activity:

- Analyzing the characteristics of voluntary and involuntary movements of the arms and legs.
- Measuring the frequency and intensity of spontaneous muscular activity (spasms, clonus).
- Asking the patient, caretaker or healthcare worker for his or her overall impression.
- Evaluating the patient's ability to carry out certain activities, like walking or personal care tasks, or the patient's general quality of life.

Measurement scales are available to help evaluate the degree of spasticity from a clinical point of view such as the Ashworth Scale, the Numerical Rating Scale (NRS) the overall clinical impression, etc.

TREATMENTS

People who suffer from MS **are likely to be treated by a multidisciplinary team** composed of medical and nursing specialists, psychologists, speech therapists and/or physical therapists. These people will determine what the best option is for your situation.

The objectives when treating spasticity are:

Mobility: to improve the use of affected limbs and a person's ability to carry out their daily activities.

- **Comfort:** to reduce the pain and discomfort associated with stiffness or spasms.
- **Personal care:** to improve posture and facilitate independent personal hygiene.
- **Quality of life:** to improve or retain the ability to carry out daily activities (mobility, work, family, recreational activities...).

For informational purposes, the **available guidelines for treating spasticity** associated with MS are described below:

1. Non-pharmacological treatments

a) Physical therapy

Physical therapy (rehabilitation) is a **key part of the treatment** of symptoms of MS and includes the following different options:

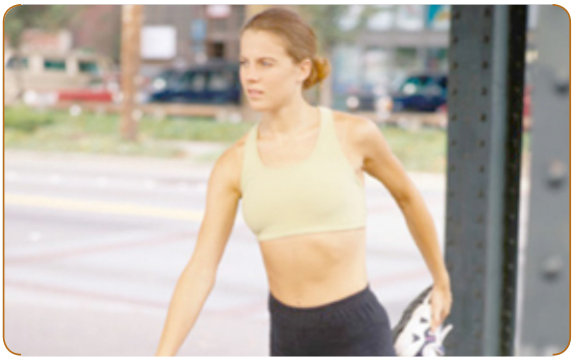
- **Physical therapy:** passive range of motion exercises that include instructions for performing the exercises regularly, as they help to strengthen, stretch and relax the muscles and, at the same time, improve joint mobility and increase blood flow. The physical therapist will likely also provide a series of exercises to do at home.

Before deciding on a treatment to follow, **the physical therapist will examine the patient** to get an idea of how he/she is doing and how he/she moves. Physical therapy may help to improve symptoms and also ensure that **bad posture or bad habits**

during movement that could worsen the spasticity are not adopted. The patient may have to change the way he/she walks or, in some cases, use an aid device that will allow the him or her to move more easily and, in this way, prevent muscle spasms.

With mild MS, patients are usually told to maintain a **good level of physical fitness** by performing **stretching and strengthening exercises**. In the case of moderate to severe spasticity, the physical therapist may include exercises and postures that reduce muscle tone (to avoid excessive muscle tone so that the muscles are less rigid), cooling therapy and muscle mobilization techniques.

The physical therapist usually provides the patient with a **stretching exercise program** to attempt to maintain proper muscle length, thereby increasing the chances that the spasms become less frequent and there is less rigidity. The stretching exercises can be active (performed by the patient) or passive (completed with the help of another person), which is why the physical therapist will also include the caretaker in the instruction.



- **Hydrotherapy (exercises in a pool)** can also help to relax the muscles. Sometimes the use of ice packs or similar items (cryotherapy) can also be useful. Massages also help to alleviate muscular rigidity.

- **Occupational therapists,** when it is possible, work together with the physical therapists. They try to determine how physical symptoms affect patients' daily lives and help them maintain their independence by teaching them movements that take into account their spasticity symptoms. For example, they determine how spasticity affects the way in which patients get up from and sit down in a chair, or in other words, how moving to and from the chair affects their spasticity. An occupational therapist will also recommend devices that will help the patient perform daily movements and ensure that the bed, chair, or wheelchair being used by the patient are appropriate.

b) Surgery

Depending on the patient and the characteristics of his or her spasticity, **surgery may be a viable alternative for severe cases of spasticity associated with MS. Different types of surgeries are used to treat spasticity.**

- Orthopedic surgery can be an option if the surgeons decide to lengthen the tendons, fuse joints or treat malformations by any other means.
- Surgical correction, accompanied by the appropriate rehabilitation, can prolong rest periods, reduce pain and avoid bedsores (weakened skin tissue that becomes hard, dry and a pearly white, gray or black in color).

c) Various orthopedic orthoses: Intended to force the correct posture of deformed limbs and allow them to be used.

d) Alternative treatments:

- Alternative treatments include **acupuncture** (for certain types of pain) and relaxation techniques like **yoga and meditation**.

2. Primary drug treatments

There are various drugs that can be prescribed for the treatment of spasticity, ranging from muscle relaxants to low-dose antiepileptic drugs. The main drugs are described below.

- Oral muscle relaxants
- Benzodiazepines
- Permitted cannabinoids

3. Invasive (injectable) drug treatments

Locally injectable drug treatments are a potential alternative for patients with spasticity that affects only a small area (focal spasticity) or that does not respond to oral medication. Various treatments exist:

- **Neurotoxins:** injected directly into the muscle, these reduce muscle tension and treat localized (focal) spasticity. The effects last for approximately 2-4 months. Tend to be part of a program that includes rehabilitation.

- **Nerve blocks using neurolytic agents:** injection of phenol or alcohol into the nerve ends in the affected area, destroying them and causing muscle relaxation. The results are relatively short-term and the procedure must be repeated every few months.

- **Intrathecally administered muscle relaxants:** a last resort for patients with spasticity in the lower limbs that does not respond adequately to other medications or if the patient cannot tolerate the other medications. Administered by inserting a catheter (small tube) into the thecal sac (the space that surrounds the spinal cord) and connecting it to a medication reservoir with an infusion pump. This is implanted surgically under the abdominal skin to directly administer the drug into the spinal cord. Requires special care.

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