CHAPTER 8

REHABILITATION IN MULTIPLE SCLEROSIS

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Multiple sclerosis (MS) is one of the most common causes of neurologic disability in young adults. In the relapsing-remitting form (RR-MS), the natural course of MS is classically characterized by relapses (in 58% to 66% of patients). With time, these relapses cause impairment and, within 10 years of onset, one half of the patients are affected by the progressive form (secondary progressive MS; SP-MS). Once the patient is on a progressive course, neither recovery nor spontaneous remission occurs, although some patients may have long periods of stability. MS also may begin with a progressive form (in 18% to 34% of patients) called primary-progressive MS (PP-MS). On average, 8 years from onset of the progressive form, the patient will experience limitations in walking; by 20 years, the patient needs support to walk; and 30 years after diagnosis, the patient can only walk a few steps. Other functional systems and processes such as the visual system, the brainstem, cerebellum, cognition, bladder, bowel, sexual function, sensory system, and cerebral also are affected progressively and cause significant disabilities in patients. These facts justify neurologic rehabilitation in MS as a process to help patients to reach and maintain their maximum physical, psychological, social, and vocational abilities and achieve an acceptable quality of life. To reach and maintain optimal function is essential in this progressive disease, and neurologic rehabilitation should be considered during all phases of the disease.

EVALUATION DURING THE NEUROREHABILITATION PROCESS

Patients affected by MS require an expert interdisciplinary rehabilitation team qualified in primary, secondary, and tertiary levels of care. This team should include a neurologist, occupational therapist, psychiatrist, family doctor, physiotherapist, nurse, psychologist, neuropsychologist, social worker, speech-language therapist, urologist, and internist.
The interdisciplinary team, in its different levels of attention, should focus on limiting the impairment, disability, and handicap that a person and his family might have as a result of MS. It is important to evaluate these parameters during the neurologic rehabilitation process. *Impairment* is considered as loss or abnormality of a psychological, physiologic, or anatomic structure or function (anatomic structural level); *disability* is the absence or restriction of a function as a sequelae of a specific impairment of the ability to perform a normal activity (functional level); and *handicap* is the unfavorable situation of an individual as a result of a specific impairment or disability that limits or restrains their performance (socioeconomic-cultural level).

The evaluation in MS rehabilitation focuses on those dysfunctions produced by impairment, disability, and handicap that affect the quality of life. It is important that all scales and instruments used in neurologic rehabilitation be evaluated according to their scientific qualities such as sensibility, validity, and clinical utility criteria.

Table 8.1 shows some of the scales used to evaluate the process of neurologic rehabilitation. Each process in rehabilitation should be assessed at least once using a scale. The value of scales is not absolute; each has its virtues and defects, but all provide valuable information. All evaluations should be performed or supervised by trained staff. The neurologist should diag-

KEY POINTS

- Patients affected by MS require an expert interdisciplinary rehabilitation team qualified in primary, secondary, and tertiary levels of care. This team should include a neurologist, occupational therapist, psychiatrist, family doctor, physiotherapist, nurse, psychologist, neuropsychologist, social worker, speech-language therapist, urologist, and internist.
- *Impairment* is a loss or abnormality of a psychologic, physiological, or anatomic structure or function. *Disability* is a loss or restriction of the capacity to perform an activity in terms of a frame considered as normal. *Handicap* is the unfavorable situation of an individual as a result of a determined impairment and disability that restricts or impedes the fulfillment of a role normal to the individual.

KEY POINTS

- Neurologic rehabilitation in MS is a process that helps an individual to achieve and maintain the top physical, psychological, and social-vocational capacities and a consistent quality of life.

TABLE 8.1 Neurorehabilitation Evaluation in Multiple Sclerosis

1. Clinical history:	Questioning and physical examination
2. Scales:	
Impairment::	Expanded Disability Status Scale (EDSS)
	Multiple Sclerosis Impact Scale (MSIS)
	Scripps Neurologic Rating Scale (SNRS)
Disability:	Multiple Sclerosis Functional Composite
	(PASAT-3, Ambulatory Index, Nine-Hole-Peg test)
	Short and Graphic Ability Score (SAGAS)
	(Nine-Hole-Peg test, 10-Meters Walk test)
Handicap:	Environmental Status Scale
Quality of Life:	Multiple Sclerosis Quality of Life-54 (MSQOL-54)
	Multiple Sclerosis Quality of Life Inventory (MSQLI)
	Leeds Quality of Life Measure
	Short Form Health Survey Questionnaire (SF-36)
Cognition:	Minimal Assessment of Cognitive Function in MS
3. Others methods:	
Images:	Photos, videos, magnetic resonance images (MRI)
Biomechanical:	Muscular strength (Manual muscular tests)
	Range of motion (Goniometry)
	Muscular activity (Electromyography)
	Aerobic capacity/VO_2 max

nose the patient's clinical course of MS and reevaluate the patient once the neurologic rehabilitation program is ended. The use of clinical scales is detailed in Chapter 9.

NEUROLOGIC REHABILITATION AND THE CLINICAL COURSE OF MULTIPLE SCLEROSIS

This chapter evaluates the practical application of neuro-rehabilitation in clinical forms of MS. The data presented are based on results from controlled clinical trials that have evaluated the efficacy of interventions using rehabilitation. The use of this data assists the neurologist in determining the best interventions to use during routine medical practice and helps to achieve overall better outcomes for patients.

NEUROLOGIC REHABILITATION IN RR-MS

The clinical presentation of RR-MS includes minor and moderate levels of disability independent of subtypes. Two subtypes are described: RR-MS 1a, in which a complete recovery occurs after the relapse, and RR-MS 1b, in which a step-wise accumulation of disability occurs with each new relapse. In the progressive clinical course of PP-MS and SP-MS, relapses are present, but tend to decrease in frequency. Each relapse after the onset of RR-MS has a permanent negative effect in the degree of disability: 42% deteriorate by half a point and 28% deteriorate by 1 point on the Kurtzke Expanded Disability Status Scale (EDDS), which is run for 64 days after the acute episode. Traditionally, it has been recommended that people with MS should avoid neurologic rehabilitation during the acute period of relapse because of the fear of causing another relapse. However, recent clinical trials confirm the value of physical therapy programs during the acute phase of the relapse and in patients with RR-MS who had accumulated

moderate to severe disability with incomplete recovery after relapse. Furthermore, intervention using neurologic rehabilitation, especially an intensive program, might have positive effects even 6 months after the relapse. Case 1 follows a patient with RR-MS type 1b treated in our clinic.

Although no progression occurs between relapses in the clinical presentation of RR-MS, the increase in relapse frequency might produce sequelae with different grades of impairment and disability.

Three clinical trials have found that rehabilitation programs might improve the patient's condition between relapse in terms of physical condition, strength, reduction in motor fatigue, and quality of life. According to these results, intensive physiotherapy and rehabilitation programs in RR-MS are effective in the treatment of relapses, not only in the acute phase but also in its aftermath. Additionally, this treatment is also useful between relapses during the mild to moderate form of this clinical course.

NEUROLOGIC REHABILITATION IN PROGRESSIVE MS

The primary goal of rehabilitation in progressive MS is to limit impairment in functional areas despite the progression of the disease. In this section, we evaluate the following aspects of rehabilitation in a patient with progressive MS:

- Physical rehabilitation on the primary and secondary symptoms
- Occupational therapy and speech-language therapy
- Neurologic rehabilitation in impairment, disability, handicap, and quality of life

Physical Rehabilitation on Primary and Secondary Symptoms The primary, secondary, and tertiary symptoms in progressive MS are the result of alterations in impairment, disability, and handicap (Table 8.2). In this section, we analyze exclusively the primary and secondary symptoms. Primary symptoms include spasticity, balance impairment, motor weakness, and tremor.

Spasticity Spasticity is one of the most frequent symptoms seen in MS, especially in the progressive course. Its physiopathology is not well known, but the final common path seems to be due to ·-motor neuron hyperactivity. This hyperactivity is triggered by an interruption of the descendent corticospinal, reticulospinal, and vestibular fasci-

CASE 1

Severe relapse without recovering in RR-MS 1b. The patient is a 27-year-old woman with a 7-year history of RR-MS and five previous relapses. She has been treated with intramuscular interferon-,1a weekly since the last relapse, but 4 months later, despite the treatment, she had an acute relapse with right hemiparesis and decreased visual acuity in her right eye. She received treatment with intravenous methylprednisolone 1 g/day for 5 days without improvement. She walked most of the time with a cane as unilateral support, had moderate to intense fatigue, and evidences an intense depression. She had difficulties with memory and thought process speed that affected her learning process at university. She also experienced urinary incontinence. Results of the neurologic exam showed the strength in the right side of her body at 3/5 and in the left lower extremity 4/5. Spasticity was severe in lower extremities. Bilateral hyperreflexia and Babinski sign was present. Mild bilateral upper extremity dysmetria was present, and right supranuclear facial paresis and temporal pallor of the left optic disc was noted. Her SNRS scale score was 67. EDSS: 6.0; Kurtzke Functional System Scale: Pyramidal: 4; Cerebellar: 2; Brainstem: 1; Bladder and Bowel: 1; Visual: 1; Sensory: 0; Cerebral/Mental: 2. The Nine-Hole-Peg Test showed delay in the execution of the test on the right upper extremity compared with the left upper extremity. Her ambulation index was 4. The magnetic resonance imaging (MRI) of brain showed an increase in the number of hyperintense lesions in juxtacortical, periventricular areas and corpus callosum, compared with the MRI taken 3 months before.

(continued on next page)

KEY POINTS

- Physiotherapy and intensive neurologic rehabilitation in RR-MS is effective in treating relapses during the acute phase and its sequelae. They are effective in mild to moderate types of this clinical course during the period between relapses.
- When spasticity is a problem, stretching exercises are effective when used in combination with antispasticity medication and complemented by the used of videos. Most people with progressive MS need therapy associated with exercises and medication for spasticity.

KEY POINTS

- Interventions using exercises programs for equilibrium and balance in people with a chronic progressive course of MS have shown effectiveness.
- Exercise treatment has a positive effect on those functions related with muscle strengthening in progressive MS.

Discussion

- Therapeutic considerations include an intensive neurologic rehabilitation program.
- The immunomodulators drugs should be assessed. Interferon-,-1a weekly could be switched to interferon-,-1a three times a week or interferon-,-1b every other day, and the possible side effects decreased with anti-inflammatory prophylaxis therapy.
- Symptomatic therapy should be undertaken, using fatigue intervention and antispasticity medication orally according to the evolution of fatigue and spasticity
- A neuropsychologic assessment is recommended to evaluate depression and cognitive impairment and then, according to the results, the possibility of psychotherapy sessions.
- Physical rehabilitation is recommended to normalize postural control, inhibit or reduce the patient's compensatory strategies (using her arms to help when sitting down or standing up), facilitate normal components of movement patterns , readapt balance and gait, and start a training program. Swimming pool sessions were deemed useful to improve cardiovascular fitness as well as muscle strength and tone, especially in right side of the body. It is important to progressively increase her physical capacity for the task.
- Occupational therapy was recommended to improve strength, coordination, precision, and rhythm when performing activities using the right upper extremity. An educational program involving energy conservation techniques and aerobic exercises designed to reduce fatigue was also developed.
- Physics medicine was consulted to develop sessions using magnetic fields for low-amplitude and frequency pulse therapy.
- A home exercise program was established.

After an 8-week intervention program, the patient's final evaluation showed that impairment improved by 14 points on the SNRS scale. Her EDSS scale was 3.5. Kurtzke Functional Systems Scale: Pyramidal: 3; Cerebellar: 1; Brainstem: 0; Bladder and Bowel: 0; Visual: 1; Sensory: 0; Cerebral/Mental: 0. The Nine-Hole-Peg test showed a significant improvement in the time taken for right upper extremity execution of the test compared with the initial measure. Her ambulation index was 2. An improvement occurred in the Environmental Status Scale to measure handicap, as well as in the MSQOL-54 for quality of life, especially in the cognitive and motor functions.

cles that control the ·-motor neurons in the spinal cord through mono and polysynaptic pathways. Spasticity is the final result of a prolonged disinhibition of the stretch reflex components, but the exact mechanism is not known. Á-Aminobutyric acid (GABA) is the principal neurotransmitter involved in the presynaptic inhibition system. Because demyelination and axon damage might occur in all the central nervous system (CNS) in MS, spasticity may be the result of spinal or supraspinal lesions. In MS, spasticity initially affects the lower limbs, in particular the extensor muscles. Later, with disease progression, the flexor muscles are affected as well. Spasticity can decrease energy, inhibit motor control, and interfere with self-care, sexual function, and work.

Four types of exercises are used to treat spasticity in rehabilitation treatment: passive movement of the extremities using different ranges of amplitude, aerobic exercises, relaxation exercises, and stretching. Bobath's method also has been used, based on the principle of the balance between reciprocal innervation and activity and the postural tone needed to achieve an optimum equilibrium in the regulation and coordination of the movements.

The results of clinical trials to evaluate the effectiveness of exercise programs for spasticity in the progression course of MS have shown that stretching exercises are only effective if they are combined with antispasticity medication and complemented by the use of videos. Further clinical trials are needed to confirm that other methods of physiotherapy improve spasticity, using standardized measures of the efficacy of the different methods. Studies done in a center specializing in the

TABLE 8.2 Primary, Secondary. and Tertiary Symptoms in Progressive MS

Primary symptoms: Consequence of impairment

- Spasticity
- Weakness
- Tremor
- Unbalance
- Numbness
- Visual
- Cognitive
- Bladder and bowel
- Pain

Secondary symptoms: Consequence of disability

- Contractures
- Infections of urinary system
- Weakness
- Osteoporosis
- Decubitus ulcers

Tertiary symptoms: Consequence of handicap

- Social
- Professional
- Marital
- Psychological problems of chronic diseases

treatment of spasticity in MS patients and using a multidisciplinary team have shown that approximately 82% of the progressive MS patients needed a combination of exercise and medication.

Exercise on a stationary bicycle, aquatic fitness programs, and swimming—and especially the last two—have been suggested to be useful during hot weather because it is well known that two-thirds of patients with MS are sensitive to extreme temperatures, more so to heat than to cold. Initial studies showed improvement in spasticity when the temperature was decreased, but recently an opposite effect was confirmed: a significant increment in spasticity after a cold bath at 24°C. Finally, spasticity is not always viewed negatively in MS because when lower limb weakness is predominant, spasticity may compensate for the weakness and allow the patient to reach a good functional level.

In summary, evidence suggests that the treatment of spasticity in progressive MS is best served through a combination of stretching exercises complemented with videos and antispasticity medication.

Balance and Coordination Impairment Balance and coordination impairments in MS are the result of lesions to the connection between the cerebellum and brainstem. Because cerebellar functions depend also on proprioceptive mechanisms, it is not surprising to find gait abnormalities also caused by lesions of the posterior tracts. During the neurologic exam, the presence of significant damage in proprioception that improves when the eyes are open implies posterior tract damage, more so if no other cerebellar signs are present such as nystagmus, limb tremor, or dysarthria. Because ataxia does not respond to medication, many clinical trials have evaluated exercise programs for possible benefits. Many exercise programs can be designed to improve stabilization, equilibrium, coordination, and relaxation. Programs have been developed to increase proximal muscle function to help in limb stabilization and change-of-position techniques; these programs include biofeedback techniques, patterning, Frenkel exercises, and even therapy using animals, such as equestrian therapy.

Many clinical trials have evaluated the efficacy of exercise intervention programs to treat equilibrium and ataxia in progressive MS. Balance improvement was observed in those patients who received external and home physiotherapy using specific techniques for facilitation and functional improvement; in those using a specific balance program with lessons and exercises; in those using a general rehabilitation program; and in those using other techniques such as aerobic and aquatic exercises. In conclusion, using exercise interventions for equilibrium and balance improvement in people with progressive MS have revealed favorable results.

Muscle Weakness Muscle weakness is an important problem in patients with progressive MS. Most studies of strengthening programs, especially for the lower limbs,

KEY POINTS

KEY POINTS

- Except for the use of splints and weighted wrist bracelets that might decrease tremor intensity, no neurorehabilitation programs are effective in improving tremor.

demonstrated an improvement in strength and lessened fatigue. Positive effects also were encountered using programs of aquatic exercises; these effects were related to favorable changes in muscular strength, fatigue, work, mobility (such as changing basic corporal posture), walking, in-home and community ambulation, and equilibrium time. In summary, we can conclude that exercise has a positive effect in functions related to muscle strength in patients with progressive MS.

Tremor Tremor is one of the most difficult symptoms to treat in progressive MS. It is present in 58% of cases, affecting the upper extremities (58%), lower extremities (10%), head (9%) and trunk (7%). Tremor is severe in 15% of patients, and it is correlated with some degree of dysarthria, dysmetria, and dysdiadochokinesia. In patients in whom tremor is dominant in upper extremities, one-third have distal postural tremor, one-third have intention tremor, and 16% have postural and proximal kinetic tremor. Except for the use of splints and weighted wrist bracelets that can decrease the intensity of the tremor, but might worsen the weakness, no proof of effectiveness exists for neurologic rehabilitation. Some progress has been observed using stereotactic surgery and medication, but tremor still can be considered the most difficult symptom in persons with progressive MS.

Neurologic Rehabilitation of Secondary Symptoms in Progressive MS Secondary symptoms are produced as sequelae of primary symptoms. These symptoms include fibrous contractures, urinary infections, inhalation pneumonia, muscle weakness, osteoporosis. and decubitus ulcers. About 15% of patients with MS develop decubitus ulcers at some time during the disease, especially those with a greater degree of disability. Risk factors for decubitus ulcers in MS are weakness and spasticity of the lower extremities, which appear in people who remain in bed for long periods. The risks are even greater when sensory loss, cognitive impairment, bladder and bowel incontinence, malnutrition, and/or hypoalbuminemia are present. Ulcers can be prevented through exercise and mobilization, with frequent position changes for the MS patient in a wheelchair or bed. Studies of bone density in mature women with MS (average age of 50 years) have shown that one-third of these patients have osteopenia and almost one-fifth have osteoporosis. Although no studies exist on the impact of exercise programs in osteoporosis prevention, maintaining a regular exercise program is recommended, not only for bedridden patients but also for ambulatory patients with MS. (The symptomatic treatment of bladder, bowel, and sexual impairments are discussed in Chapter 5.)

Occupational Therapy in Progressive Multiple Sclerosis Occupational therapy is a support treatment that optimizes functional capacities. Its goal is to allow patients to participate in self-care, work, and recreational activities as needed. Generally speaking, patients with MS are sent to occupational therapy for symptoms such as fatigue and upper limb impairment (weakness, motor coordination impairment, sensory loss, and spasticity) that produce limitations in the development of social and daily life activities. The occupational therapist (OT) educates patients in energy conservation techniques, time management, efficient body mechanics, and task improvement both with and without aids. According to the result of an analysis of many clinical trials with high methodologic quality, evidence suggests that educational courses on energy conservation had a very positive impact on fatigue and in some aspects of the quality of life, preserving this improvement from 6 weeks up to 1 year. On the other hand, information-only courses have not shown efficacy.

In other measurements related to occupational therapy in patients with chronic MS, moderate improvement was found in the coordination of upper limbs after an exercise program. However, new studies are necessary to prove the efficacy in other aspects of occupational therapy in MS.

Speech-Language Therapy Although changes in phonation, oral articulation, swallowing. and respiration that are present in patients with MS are better evaluated and treated by a specialist in speech-language therapy, it is important for the neurologist to recognize the relevance of this impairment, which is more frequent in progressive MS.

Impairments of word articulation and language use are termed *dysarthria* and *aphasia*, respectively. Dysarthria is impairment in oral articulation that includes a group of alterations due to muscle control disturbance secondary to nervous system lesions. The frequency of dysarthria in MS in different studies is on the order of 23% to 51%, and it is classified as either spastic, ataxic, and mixed. Generally, patients with MS exhibit speech changes such as hypernasality, vocal harshness, inadequate tone level, and impaired amplitude control. The articulation is deficient, and increases in the breathing rate, air emission, and distress are noted. About 35% of patients have decreased vital capacity and 42% have inadequate ventilation. Rehabilitation interventions in the basic motor processes of speech include establishing strategies for dealing with problems in articulation, phonation, resonance, prosody, and respiration, with specific objective of improving the overall ability of the patient with MS.

In dysarthria, rehabilitation intervention has been observed to improve articulation precision, vocal sharpness, speech naturalness, resonance, duration of maintaining phonation, and quality of life. The efficacy of such rehabilitation treatment depends on the interaction between the patient and the speech-language specialist as well as the degree of impairment, activity, and participation.

Aphasia in MS occurs less frequently than does dysarthria, and it can be acute or chronic. Chronic aphasia, more common in progressive MS, seen in approximately 0.7% to 1% of patients, compared with acute aphasia, which is seen in about 0.81% of cases of MS. Chronic aphasia is more common in RR-MS. Aphasia was the initial symptom in 36% of the cases presenting with acute aphasia, and it has a good prognosis for improvement—on the order of 64% to 72.7%.

Swallowing disorders are characterized by the presence of dysphagia produced by impairment in the swallowing center localized on the brainstem. Dysphagia is present in 3% to 41% of patients with MS, and a significant correlation exists between dysphagia and severe brainstem damage (OR = 3.24; 95% CI 1.44–7.3) and the severity of the disease (OR = 2.99; CI 1.36–6.59). In the progressive phase, dysphagia may have severe consequences in MS patients including saliva and food inhalation with the possibility of developing malnutrition, aspiration pneumonia, and dehydration.

The objective of treatment for swallowing dysfunction in patients with MS is to maintain or improve the nutritional state of the patient. Areas for intervention include changes to the environment in which the patient feeds himself, food texture, attitude during the feeding process, changes in the neuromuscular process, and changes in the feeding methods developed as compensatory techniques. The effectiveness of these interventions has been evaluated in a study, the objective of which was to assess the swallowing function in 143 patients with progressive MS on whom an endoscopy was performed. It was found that 49 (34.3%) had this abnormality. The compensatory rehabilitation techniques were sufficient to eliminate dysphagia in 46 (93.8%) of the cases, thus decreasing the potential risk of inhalation and malnutrition. In respect to the risk of inhalation, videofluoroscopy studies showed at least 10% of patients with dysphagia exhibit signs of inhalation. This result showed the need of a complete assessment of the swallowing function in patients with MS who have dysphagia, especially those with brainstem damage and in those patients with progressive MS with severe disability. Although the risk of inhalation is approximately 10%, the compensatory rehabilitation techniques are effective, allow better nutrition for the patient, and avoid respiratory complications.

Respiratory insufficiency usually is described as the final stage in MS, with a lethality of 8%. However, in the majority of cases, poor and inadequate attention is given to the progressive aspect of the restrictive nature of the respiratory component of MS. Generally, therapeutics starts late, when the restrictive respiratory failure worsens in association with an obstructive component. Therefore, an early professional assessment and continuous treatment are needed, starting with an adequate classification of the respiratory failure and the use of noninvasive respiratory techniques. The application of noninvasive respiratory techniques on

KEY POINTS

- The global impact of occupational therapy in MS fatigue has been confirmed by educational courses in energy conservation and in upper extremity coordination and strengthening exercise programs.
- Dysarthria is present in 23% to 51% of patients with MS. Two clinical trials have indicated some efficacy of the neurologic rehabilitation program. Aphasia is a less common speech disorder.
- It is necessary to evaluate the swallowing function in all patients with progressive MS with brainstem lesions and severe disability. Compensatory rehabilitation techniques are effective in eliminating dysphagia to a high degree, thus allowing better nutrition and avoiding respiratory complications.

KEY POINTS

- Respiratory restrictive dysfunction is present early in people with MS. As the disease progresses, an obstructive component might appear. A rehabilitation program for inspiratory muscles in persons with advanced progressive MS is recommended.
- Even though neurorehabilitation does not improve impairment in a progressive course of MS, it has a positive impact in disability, handicap, and quality of life. The neurorehabilitation impact in quality of life is determined by disability and handicap more than by the functional deficit and progression. The neurorehabilitation process should be permanent during illness evolution, and it is the only treatment that might guarantee a good quality of life.

these patients is important to avoid or worsen respiratory failure. Clinical trials have confirmed the efficacy of a training program for improving the strength of inspiratory muscles, respiratory capacity, fatigue, and patient subjective perception in patients with advanced progressive MS. In summary, a rehabilitation program for inspiratory muscles in persons with advanced progressive MS has a beneficial effect on the strength of the muscles that participate in inspiration and it is recommended in the process of neurorehabilitation.

NEUROLOGIC REHABILITATION IN IMPAIRMENT, DISABILITY, HANDICAP, AND QUALITY OF LIFE IN PROGRESSIVE MS

Neurorehabilitation does not stop either disease progression or neurologic impairment in MS, but it does improve disability, personal activities, and participation in social activities. As a result, an improvement in handicap and in quality of life is realized.

The quality of life is determined more by disability and handicap than by functional deficit and progression of the disease.

A randomized, controlled, clinical trial conducted in persons with progressive MS showed the efficacy of an individualized 6-week exercising program to improve disability, as compared to controls. Nevertheless, no change was noted in impairment in any of the groups.

Other clinical trials that compared an exercise program treatment against controls in patients with progressive MS found a significant improvement in general health parameters related to quality of life, even after 9 weeks.

In another clinical trial, a group of MS patients participated in a rehabilitation program as inpatients. They were randomly divided in two groups: one receiving aerobic exercises and the other one receiving no exercises. Compared to the initial score, the group with exercises had a significant improvement in the aerobic threshold, an improvement in the quality of life according to SF-36 score, and an increment in the activity level.

Few studies have evaluated the follow-up of progressive MS patients after applying a rehabilitation program in the hospital; this was carried out in persons with progressive MS, in which 92% were followed and evaluated periodically for 12 months. Although the degree of impairment deteriorated by 1.2 points in EDSS over the course of the 12 months, an improvement in disability and handicap remained for 6 months, in the emotional state for 7 months, and in the physical component of quality of life as measured by the SF-36. This result indicated the need for progressive MS patients to maintain a continuous rehabilitation program in specialized centers and also in the community.

SUMMARY

Neurologic rehabilitation is a valuable component of MS treatment. This treatment might have a positive effect in patients with RR-MS who can be benefic during and after the acute phase, and between relapses. Even though the neurologic rehabilitation in progressive MS does not improve impairment, which continues to progress, it has a positive impact on many symptoms, disability, handicap, and many aspects of quality of life. The neurologic rehabilitation process should be continuous throughout the evolution of the disease, performed both at specialized centers and especially in the community.

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