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REHABILITATION OF MOTOR FUNCTION IN HEMIPLEGIC PATIENTS

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ABSTRACT

Stroke is a common condition that causes a complete or incomplete motor deficit, associated or not with other neurological disorders. Management is multidisciplinary, requiring regular follow-up where rehabilitation plays a major role, especially the re-education of the motor function which must be started as soon as possible. The means of rehabilitation available are numerous to make a choice of program adapted on a case by case basis. The main goal is to restore motor abilities, supplement the deficit functions and improve the quality of life of the hemiplegic patient for better autonomy.

KEYWORDS: hemiplegia, motor function, rehabilitation.

1. INTRODUCTION

Stroke is considered to be the leading cause of death in industrialized countries, as well as cardiovascular disease. They are also classified as the leading cause of disability in adults with an estimated prevalence of 2400 new cases / million inhabitants each year [1].

Recidivism depends mainly on the underlying cause with a risk of 3 to 4% per year, hence the importance and importance of primary and secondary prevention of the various risk factors and underlying etiologies of this pathology. The cerebrovascular accident is defined as a deficit of a focal brain function of brutal installation causing symptoms of duration greater than or equal to 24 hours and whose origin is vascular. The various neurological charts reflect the cerebral pain of the affected area, either an area of necrosis in the case of ischemic stroke or hemorrhage area in case of haemorrhagic stroke. The evolution of stroke is classically divided into three main phases, the management of which differs.

We distinguish:

- The acute phase up to six weeks,
- The neurological recovery phase from the end of the acute phase to 18 months,
- And the sequelae phase that extends beyond 18 months.

The care is multi-disciplinary including several medical and paramedical (neurologist, intensive care unit, masso-physiotherapist, occupational therapist, speech therapist, psychomotor, neuropsychologist, social assistant, all headed by a physical and rehabilitation physician).

The motor deficit is one of the main symptoms of stroke, the territory of which depends on the damaged topographic zone, which may interest the pyramidal tract in any region of its path.

Currently, and with the aim of improving the quality of care delivered to hemiplegic patients, it is recommended [2]:

- Start motor rehabilitation as soon as possible,
- Stimulate the sensory function in the absence of voluntary motor activity in the acute phase of stroke,
- Put in place the different methods of motor rehabilitation,
- Practice individual manual rehabilitation in the management of stroke during all stages of evolution,

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- In the chronic phase of stroke, work on muscle building to improve strength, not function; knowing that this is not going to aggravate spasticity,
- Introduce the notion of time and its effect in the work of walking given its favorable impact on motor and walking recuperation,
- Improve the independence in the movements by the functional rehabilitation of the march started as soon as possible and maintained throughout the rehabilitation treatment,
- Include the patient and his entourage in this care by the therapeutic education in order to optimize the expected results,
- Communicate objectives, means and methods of rehabilitation, results obtained and difficulties encountered or other observations at each stage of transfer, change of service or when returning home.

The objectives of the motor rehabilitation of a patient suffering from stroke are the secondary prevention, the maintenance and the muscular conservation, the stimulation of the neuromuscular recuperation, or the replacement of its disorders, and this by applying manual therapeutic means or instrumentals.

The existing means are different in their concepts and principles. According to the experience of the reeducators, the programs used are varied with proven clinical and functional efficacy [2].

2. REHABILITATION METHODS OF MOTOR FUNCTION

Rehabilitation of sensitivity
it must be early and intensive, particularly the proprioceptive sensitivity. Stable sitting equilibrium is the primary goal to achieve [3, 4]. The postural reeducation of the trunk in discharge is started from the wheelchair by stimulating the postural control.

The postural reeducation of the trunk in charge is carried out by rectifying techniques with type of lateral inclinations with support on the upper limbs, previous inclinations with support of the hands on the knees and posterior inclinations with back support on the hands. Sitting balance is enhanced by multidirectional and unbalanced thrusts that include proprioceptive and exteroceptive stimulation.

Anterior, posterior and lateral parachute reactions can be stimulated by Klein balloon exercises. The rebalancing of the supports is based on the awareness of the support deficit, the use of visual feedback, the use of Perfetti-type exercises, balancing exercises in bipodal and then unipodal support and the dissociation of belts.

Manual rehabilitation
The passive mobilization of the joints during thirty minutes leads to the appearance of a cortical activity corresponding to the representation of the mobilized muscle under the effect of the proprioceptive stimulations [5]. Fig 1.

This manual rehabilitation also improves the relationship and the reeducator-patient contact.

Physical activity
not to fall into the problem of cardio-respiratory physical deconditioning by improving the work of strength and endurance.

The ability to adapt to exercise decreases in patients with stroke hence the importance of setting up an aerobic exercise program during management [6]. This improves overall fitness by increasing walking speed without strengthening spasticity [7].

Exercises applied after taking a cardiological opinion can be either on:
- A progressive cycle cycloergometer
- A treadmill to improve walking speed and perimeter
- A re-education bike for joint lapping
- Be the practice of table tennis to improve transfers of support.

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Muscle strengthening
Muscle strengthening has recently been shown to increase the muscle strength of hemiparetic muscles and does not increase spasticity [8].

Intensive rehabilitation: consists of targeted rehabilitation of a functional task with a high number of repetitions.
Neurophysiological approaches:
these are neurodevelopmental rehabilitation, proprioceptive neurofacilitation and sensorimotor integration (such as Bobath, Kabath, Rood, Brunstrom ...), and Perfetti-type cognitive-behavioral therapy techniques. There is no superiority of one technique over the other.

Motor Learning [9]:
To stimulate attention and motivate patients, they are offered to repeat functional tasks. The goal is to develop the patient's coping skills because the feedback from the motor activity is mainly visual and verbal. This is a pragmatic approach based on the concept of neuroplasticity.

Electrotherapy:
Functional electrical stimulation [11], which when applied to the nerve trunk or muscle stimulates voluntary movement. Its principle is the inhibition of antagonists at the time of contraction of agonists. It is often applied to the common fibular nerve to cause dorsiflexion of the foot during heel detachment at the beginning of the oscillating phase of walking.

Combined therapeutic approach: combining two or more methods of rehabilitation in the adopted program.
The walk:
Rehabilitation of walking: from the acquisition of the balanced standing position and obtaining a motor control of the hemiplegic lower limb. At first, it is carried out between the parallel bars, then with human helpers (massokinesitherapist), or techniques (walker, tripod rod) Fig 2. The results are progressive interesting stability, efficiency and speed. It would be better to mention the results and represent them in the form of a histogram to clearly visualize the evolution and especially to motivate the patient.

Treadmill: gradually increasing the speed, holding and then without standing, level flat and then slope.

Walking orthoses: they are indicated to compensate for the walking defects that can be detected by the reeducator whose aim is to improve the walking pattern, the advancement of the lower limb in triple flexion, the attack of the ground by the heel, the correction of the deficit of the levers, also to improve the unipodal support time on the lower limb and the dissociation of the belts. The recurvatum of the knee by default of proprioception, and the defects of positioning of the foot, can be corrected by the orthotics.

Technical aids for walking: correspond to extrinsic and non-orthetic devices that can improve the quality of walking.

Induced stress: the effect of this technique has been studied in several international centers, proving that the placing of the upper limb under stress, leads to an important cortical reorganization with beneficial effect of the repetition of the spot [12, 13, 14].

Rehabilitation assisted by robotics:
This is a robotic system applied in the field of disability, also called system of cooperation or comanipulation. Its use has emerged since 1970 in neuro-rehabilitation and seems to have proved its effectiveness regardless of the level of motor impairment and the age of the stroke, although the early management is still the best therapeutic indication for a better functional recovery. The robots easily produce repetitive movements, intensify the reeducation, provide multiple exercises and offer human-machine interactivity. They also allow reliable quantitative measurements of physical abilities. In addition, assisted rehabilitation would prevent the occurrence of common complications of stroke such as muscle atrophy, spasticity and osteoporosis [15]. Assisted robot therapy has proven its effectiveness in terms of the ability to perform the gestures of daily living following a

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recent stroke [16]. However, the improvement of the measure of functional independence has not been noted according to several studies.

The rehabilitation of the upper limb by simultaneous bilateral movements: the purpose of this method is to stimulate the motility of the hemiplegic limb by means of symmetrical movements at the same time as the member supposed healthy and bilaterally.

Mental Imaging: Research in this area has long been limited in psychology. Then, its use spread to neuro-rehabilitation. It is defined by the mental representation of a movement or a motor sequence without it being accompanied or followed by its execution [17].

In the current framework of advances in neuroscience and evidence-based medicine, mental imagery seems to be a promising technique for re-educators [18].

Virtual Reality: [19] This is a multidisciplinary field that intersects the interception between the sciences of engineering and the human sciences. In the context of medicine, virtual reality has taken a considerable place as well as a new therapeutic tool in the management of psychological disorders and the rehabilitation of disability in general.

It is also applied in surgical simulation for learning, endoscopy, psychiatry, neuropsychology and rehabilitation.

Virtual reality is used to simulate the real environment. It is therefore a flexible therapeutic means based essentially on visualization and interaction equipment, feedback and motivation. For this purpose, a series of practical tests and errors associated with a feedback of sensory information on the patient's capacities are carried out. Motivation then stimulates movement training. This improves the rate of motor rehabilitation.

It is therefore necessary to evaluate the relevance of the neuropsychological processes evoked by the feedback because the latter is the pivot of motor rehabilitation.

3. CONCLUSION

In general, the clinical picture caused by stroke is multiple. Motor rehabilitation plays a prominent role in the management of hemiplegics and the reeducator must adapt its program on a case-by-case basis, taking into account the associated disorders. The care involves a medical and paramedical staff, each offering its program to meet goals set by the entire team capped by a physical and rehabilitation physician.

Motor rehabilitation should be started as soon as possible despite possible cognitive impairment, and is an integral part of follow-up care programs. It is necessary to ensure the correct observance of the treatments and to maintain the motivation and the participation of the patient and his entourage in order to optimize the expected results.

4. CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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Fig 1: Passive mobilization of the joints of the hemiplegic lower extremity.

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Fig 2: Rehabilitation of walking with technical aids.